

# Does whitebark pine have a refuge from mountain pine beetle at treeline?

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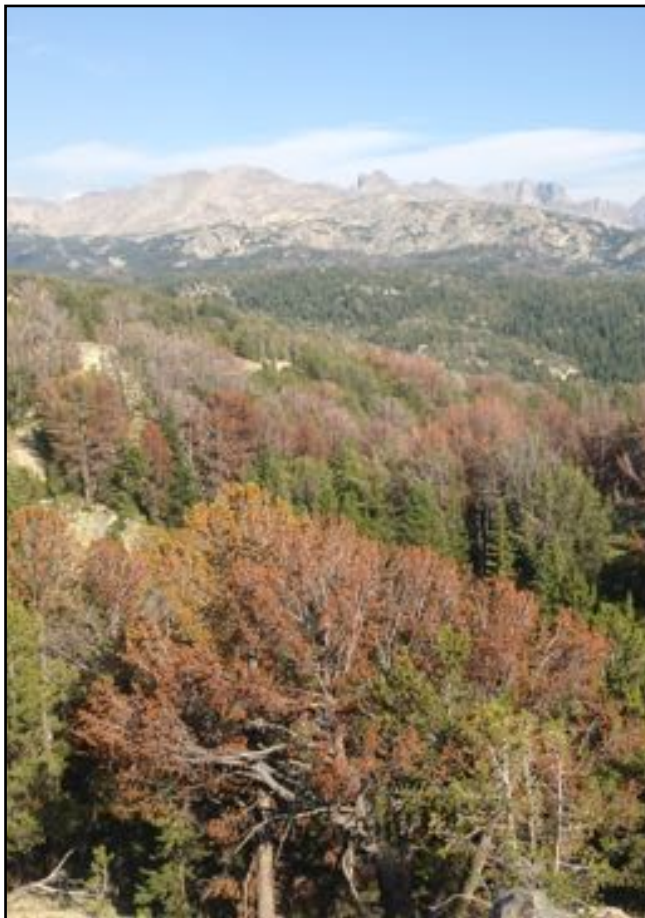
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WHITEBARK PINE  
ECOSYSTEM FOUNDATION

1

Mountain pine beetles are causing historically unprecedented mortality in high-elevation whitebark pine. Refuge habitats are one way by which populations may persist through these impacts.



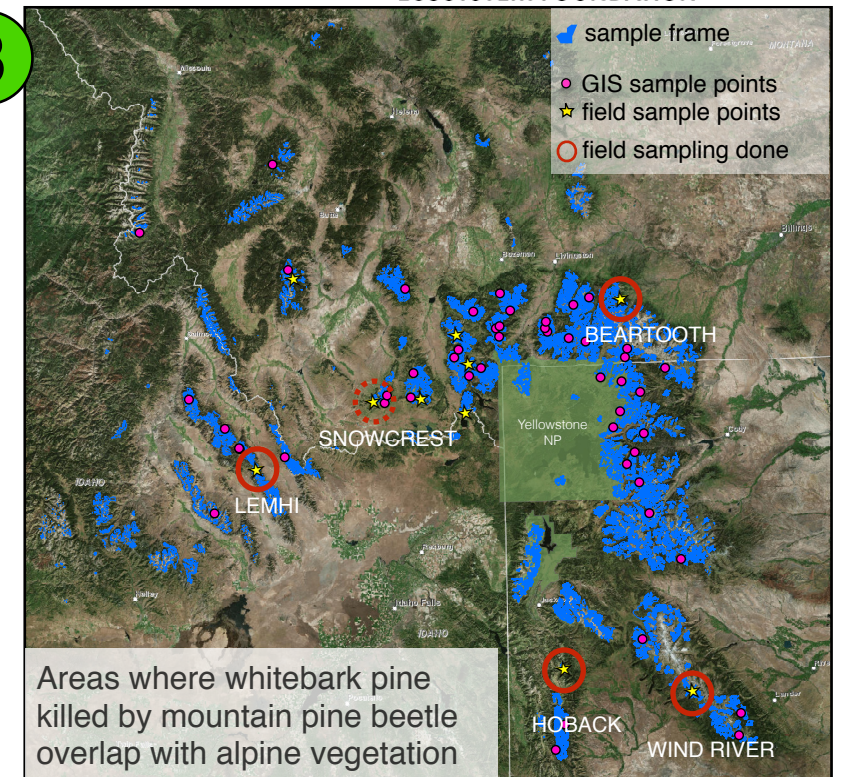
2

Alpine treeline ecotone habitats may be refuges for whitebark pine from MPB attack because treeline growth forms (krummholz) are too small for beetles (Logan et al. 2010, Macfarlane et al. 2013).



Beetle-caused mortality below treeline and living krummholz, Tobacco Root Mountains, MT

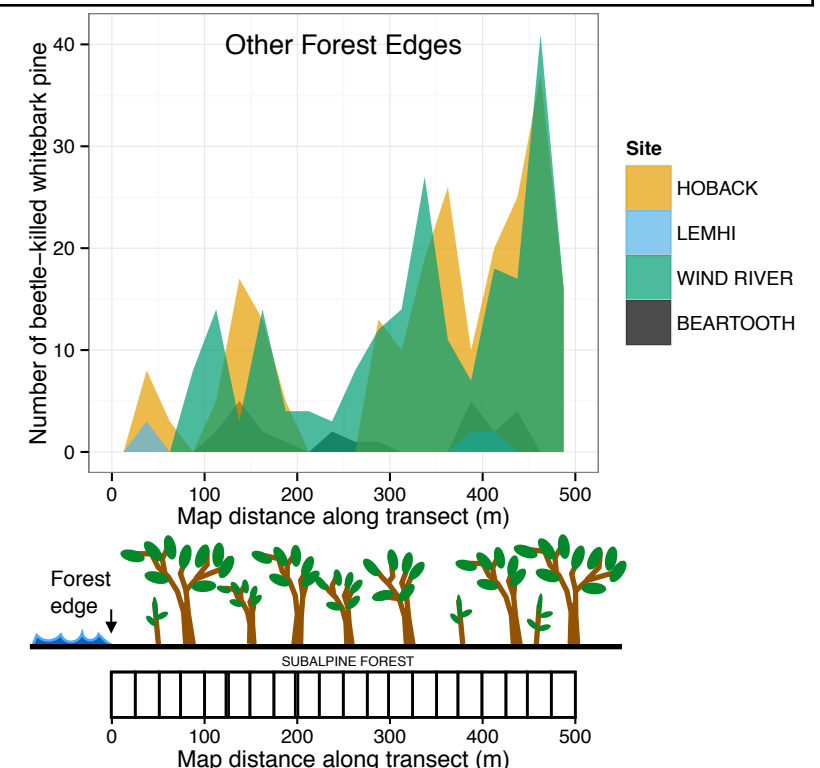
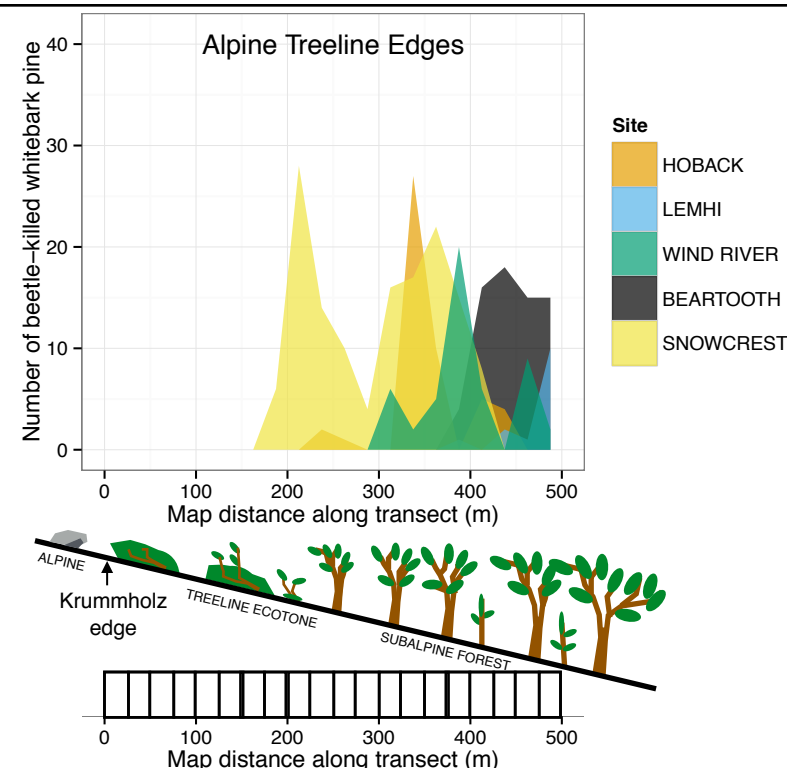
3



Areas where whitebark pine killed by mountain pine beetle overlap with alpine vegetation

4

Preliminary results from field transects suggest a strong mortality gradient at treelines, and less so at other edges (e.g., cliffs, talus, meadows, lakes, etc.). This is consistent with the hypothesis that treeline habitats are refuges. Treelines may be refuges because of transitions in growth form and because reduced mortality may be common to all forest edges.



## Acknowledgements

The Whitebark Pine Ecosystem Foundation provided travel funding for this study. Thanks also to Wally Macfarlane for sharing an impressive GIS dataset of whitebark mortality in the Greater Yellowstone Ecosystem.

## References

Logan, J. A., W. W. MacFarlane, and L. Willcox. 2010. Ecological Applications 20:895–902.  
Macfarlane, W. W., J. A. Logan, and W. R. Kern. 2013. Ecological Applications 23:421–437.